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Pandora Moth

A LEPIDOPTEROUS DEFOLIATOR OF PINE ON THE KLAMATH INDIAN RESERVATION. OREGON

MEMORANDUM FOR DR.A.D.HOPKINS.

ORDER - LEPIDOPTERA?

FAMILY - SATURNIIDAE.

GENUS - COLORADIA.

Coloradia pandora, Blake.

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UNITED STATES DEPARTMENT OF AGRICULTURE.
BUREAU OF ENTOMOLOGY,
WASHINGTON, D. C.

FOREST ENTOMOLOGY.

MEMORANDUM FOR Dr. A. D. HOPKINS, FOREST ENTOMOLOGIST.

A LEPIDOPTEROUS DEFOLIATOR OF PINE ON THE KLAMATH INDIAN RESERVATION, OREGON.

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Ashland, Oregon.
November 15,
1922.

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COLORADIA PANDORA, Blake.

ORIGINAL NOTE:

Hopk: 16241 - Pinus ponderosa and Pinus murrayana. Headwaters of the Williamson River and Upper Klamath Marsh, Klamath Indian Reservation, Oregon. Long: 121 deg. 30Min. W. - Lat: 42 deg. 50 min. N. Elevation 4800 feet. August 24, 1921. J. M. Miller, J. H. Pollock and J. E. Patterson collectors.

a - Lepidoptera - Pupae of large defoliator collected in soil under and around host trees. These pupae were naked and were buried from 1 to 3 inches below surface of soil which was composed of loose volcanic ash. The damage to the hosts consists of defoliation caused by the caterpillars eating the needles to within one-half inch of the petiole. In areas of heavy defoliations, where conditions indicate that the epidemic has been present for some years, from 50% to 90% of the needles have been stripped from the trees. It was noted that the caterpillars do not feed on the new needle buds. The prevalence of the insect was shown by finding 84 pupae in an area of ground 10 feet square.

b - Dipsera - Puparia collected from soil in pupal beds of a-. These are probably parasitic on a- They were collected wherever(a)was found.

c - Diptera - Parasite of (a). Larvae found in dried host larvae and pupae.

REARING NOTE:

A part of the original material collected (40 pupae of (a)), was sent to Washington, D. C. for attention of Mr. Carl Heinrich. The rest of the material was caged at Jenny Creek, Oregon on August 30, 1921.

The material was placed in a rearing tray 20 X 30 inches square. This tray was constructed with a copper mesh screen bottom and a wire mesh screen lid. About 4 inches of soil brought from the locality where the insects were collected was dumped in this tray. The pupae were placed in this soil from 1 to 3 inches below the surface. The tray was then placed in the open woods to secure, as near as possible, the same conditions that prevail in the native habitat. The elevation at Jenny Creek is slightly under 4,000 feet.

During the balance of the fall of 1921 the cage was examined from time to time without noting any activity on the part of the insects within.

May 10, 1922. - Examined the material and found that a number of the moth pupae had died. A few adults of (b) had emerged and were collected from the cage.

June 20 to 30, - A number of adults of(a) emerged during this period. They were fed sugar water in the cage and lived for 4 or 5 days after emergence. This would appear to be a trifle early for the species to emerge but may be accounted for by the material being at a lower elevation than in the locality where it was collected. Adults were reported flying on the Reservation during July and I observed straggling specimens flying in July at a number of places west of the Klamath Lakes. Individual adult specimens were collected at Round Lake, Aspen Lake, Clover Creek, Oatman Lake, Mill Creek and Jenny Creek. From this it would appear that there is a light infestation throughout this territory or else stragglers strayed far from the epidemic area on the Klamath Reservation.

HISTORY OF THE INFESTATION:

The history of this insect on the Klamath Reservation up to the spring of 1920 is clouded in more or less obscurity. The following short account is from Mr. F. Marion Wilkes, Forest Topographer to the Indian Service, who has been detailed on topographic work on the Klamath Reservation and has worked on an in the vicinity of the infested areas since 1918. Mr. Wilkes is personally known to the writer as a careful observer and a very capable woodsman of naturalistic inclinations. Therefoer his observations and findings are of great scientific value and accuracy. According to him the Indians are and have been familar with the insect for a long period of years. In years past the pupae of the moth was an article of food with the Klamath and Modoc tribes of Indians and was considered a delicacy when roasted. The Indian name for the pupae, as verified by Mr. Wilkes, was "Bull Quanch". The younger generation of these Indians know very little about the insect as they are far removed from the tribes' aboriginal customs and manner of living.

The information that Mr. Wilkes obtained from the older Indians was to the effect that the insect appeared at intervals of about 20 years separation, but when it did appear persisted for 3 or 4 years in continuous epidemic. As near as could be ascertained from this source the last epidemic preceding the present occurred about 22 years previous to 1919.

So much for past history: The authenic history of the present epidemic starts in the spring of 1920 when Mr. Wilkes reported

large numbers of caterpillars on the yellow pines near the mouth of the Sprague River in the vicinity of Chiloquin. The timber here was being greatly defoliated. Later during the same season (August 1920) the writer met at Algoma, Oregon, Mr. W. J. Chamberlin, of the Oregon Agricultural College, who had just returned from a field trip into the forests south of the Sprague. He reported a great flight of moths in this locality; also large areas of defoliated trees. He had collected a large number of adult specimens on this trip. During the same month the writer collected a few living specimens on Jenny Creek, Oregon. In April, 1921, the writer in company with Mr. Chas. W. King made a trip into the Reservation to examine the timber on the headwaters of the Williamson River. During this survey a large body of defoliated yellow pine was examined a short distance north of Calimus Butte. Many empty pupal cases of the moth were found on the ground in this area but no living insects were seen. A few days later some small, dark green, Lepidopterous larvae were found attacking yellow pine needles on trees in the vicinity of Riggs Springs. These larvae were undoubtedly young Coloradia. At this time the larvae of the insect would be very small as winter conditions still prevailed. Later during the season of 1921 (in August) the writer in company with Mr. J. M. Miller and J. H. Pollock visited this same locality and collected a large number of pupae in the defoliated areas. The entire generation was in the pupal stage at this time. Mr. King, who had been conducting light burning operations on the Long-Bell Reservation Tract during the previous part of the summer, reported that great numbers of the caterpillars had been feeding on the

on the needles up to ten days previous to our visit on Agust 20th.

After examining the defoliated areas in this vicinity of Riggs Springs the party went to Mr. Wilkes camp on Deep Creek. We were met there by Mr. Wilkes who stated that the severest defoliation he had observed was in Twp. 31, R 9E, adjoining the Klamath Marsh. In company with Mr. Wilkes the party visited this area and made a careful examination of the damage here. This examination confirmed Mr. Wilkes previous statement. The yellow pine trees on this area had suffered severely; to the extent that perhaps 90% of the previous two years crops of needles had been eaten. The prevalence of pupae under the trees also showed that the area was more heavily infested than any other area which had been examined.

Unfortunately, owing to the pressure of other work, the writer was unable to visit these areas again in 1921 or at any time during the deason of 1922.

THE MOTH:

DESCRIPTION:

ADULT: General color brownish gray: Antenna pectinated, yellow: Thorax and abdomen above, brownish, clothed with soft hairs, sides grayish with hairs. Apex of abdomen tufted: Forewings above brown with gray scales, a small black spot on the disc, below, pinkish gray. Hindwings same color as forewings, also with dark spot on disc. Cilia whitish. Length of body, 40mm. 35mm. Expanse, 90mm. 70mm.

EGGS: Pale bluish green in color. Semitransparent when deposited; later becoming dull green and opaque. They are approximately 2.5mm long and 2mm in width. They are deposited in clusters of a few eggs to 60 on the trunks of the host trees.

LARVAE: The full grown larvae or caterpillars are over 45mm. in length and are greenish in color. The young larvae are dark green to brown with black head and thoracic shield.

PUPAE: The pupae are brownish black in color. They are approximately 25mm. long and 12mm. wide. They are found from 1 to 3 inches below the surface in loose soil. There is no cocoon, the pupae being naked and inclined slightly from the verylcal with the head up.

LIFE HISTORY:

The data in hand to date indicate the following partial life history of the species in this locality. Attention is called to the fact that our records are as yet far from complete; therefore subsequent work and observations may give additional data which will clear up some of the present more or less obscure phases of the insects development and habits.

Adults emerge and fly during July and August of alternative years.

Eggs are deposited during the flight period. They are placed in the crevices of the bark on trunks and limbs of the host trees and occasionally in the debris on the ground surrounding the [illegible] have not definitely determined whether the eggs

Note: Mr. A. J. Jaenicke found young larvae, approximately 10 mm long, feeding on the terminal shoots of pine trees in the vicinity of Wocus Marsh, Twp. 31s R 9, Klamath Reservation, in early September 1922. The young caterpillars were dark green in color with large black thoracic shields. This note, which was received from Mr. Jaenicke after this memorandum was written, is of great value in showing that the caterpillars hatch the same season that flight occurs.

they feed on the needles of the preceding two years growth, but do not attack the young needles of the current years growth.

Pupae begin forming in July and by August 20th the entire generation is in this stage. The pupal stage lasts until July of the next year when flight again occurs.

From the preceding it will be observed that the life cycle covers a period of two years. Flight occuring every alternative year. This is graphically shown by the accompanying chart.

HABITS AND DAMAGE:

The larvae in this locality feed on the needles of yellow pine (Pinus ponderosa) and lodgepole pine (Pinus murrayana). Ithas not been found to feed on any other species. Its habit of feeding on lodgepole pine appears to be purely accidental; therefore it may be said that the insect is primarily an enemy of yellow pine. Its attacks are confined to the mature or nearly mature needles, very rarely attcking the buds of the new growth or the very young needles. This habit, coupled with its two year life cycle, offers the host trees breathing spells in which to recover from nearly complete defoliations made during the feeding periods of the larvae.

The primary damage to the attacked trees consists of weakened vitality through the loss of needles during the periods of the trees growth. To the knowledge of the writer this damage has not, in any case, resulted in the death of attacked trees. However, it is quite possible that many of the defoliated trees may fall victims to barkbeetles or other tree killing insects for owing to their weakened

condition these trees could not repel even a light attack made by any species of these insects. This is a contingency which deserves attention for it is known that there is at the present time an epidemic of Dendroctonus brevicomis in the adjoining pine timber to the south and east of the defoliated areas. This adjoining infestation is a menace which may result in an invasion and consequent extensive killing of the defoliated stands.

DISTRIBUTION:

The known distribution of the present epidemic covers an areas of about 12 townships located approximately in the center of the Klamath Indian Reservation. The boundaries of this area may be roughly drawn as follows: From Calimus Butte east to the Sycan River, thence up the Sycan to Long Creek, up this creek to its source, thence to Yamsay Mt and down Deep Creek to the Williamson River, following down the latter to the Klamath Marsh, thence south to Calimus Butte.

Infested areas south of the Sprague River have been reported. Though the writer has not been on these areas it is believed the reports are authenic.

Individual specimens of living moths have been collected throughout the pine timber in the entire Klamath Basin. However, the insects work or damage has not been discovered in this region outside the Klamath Reservation.

The present known distribution is shown on the accompanying map.

NATURAL ENEMIES:

The known natural enemies of the pandora are few. The degree of natural control which they exert has not been determined.

Two Diptera of the Tachinid family have been determined as parasitic on the caterpillars. These species are as yet undetermined.

Small Rodentia; (Sciurus and Spermophilus) are known to prey on the pupae. Many caches made by chipmunks (Spermophila) have been found in the infested areas. Some of these caches contained as many as 90 pupae. The rodents dig the pupae from the soil leaving short burrows 1 to 3 inches deep as evidence of their activities. 40 of these burrows were counted in one area of 10 feet square.

ARTIFICIAL CONTROL:

The ordinary methods of artificial control, such as spraying the trees with contact or stomach poisons or collecting and killing the pupae, are not practicable on large forested areas such as are found in these infestations.

An alternative method, which is believed would be effective, consists of direct attack by the use of fire during the feeding period of the larvae. This method in application would involve the following proceedure: Ground debris fired and burned on the ground under the infested trees would cause the caterpillars to fall to the ground as a result of stuperfaction induced by the smoke and gases ascending through the trees from the fires. Many of the caterpillars would fall directly into the fires and die; those which fell outside the fires could be raked in with an ordinary garden rake.

This method is known to be effective to an undetermined degree as it was unintentionally applied by Mr. King during forest light burning operations carried out on some of the infested areas during the summer season of 1921.

BIBLIOGRAPHY:

The literature on Coloradia pandora known to the writer is given below. Probably there is other literature than that listed here but which the writer has not seen.

Blake, C. A. Proc. Ent. Soc. Phila. 11, p279, 1863.
Dyer, H. G. U.S.Nat'l. Museum. Bull. No. 52, p74.
Comstock, J. H. Manual For the Study of Insects, p350 12th ed. 1914.
Aldrich, Dr. J. M. Jour. N. Y. Ent. Soc. Vol 20, p28.
Chamberlin, W. J. Jour. N. Y. Ent. Soc. Vol 30, No. 1, pp69-72, 1922.

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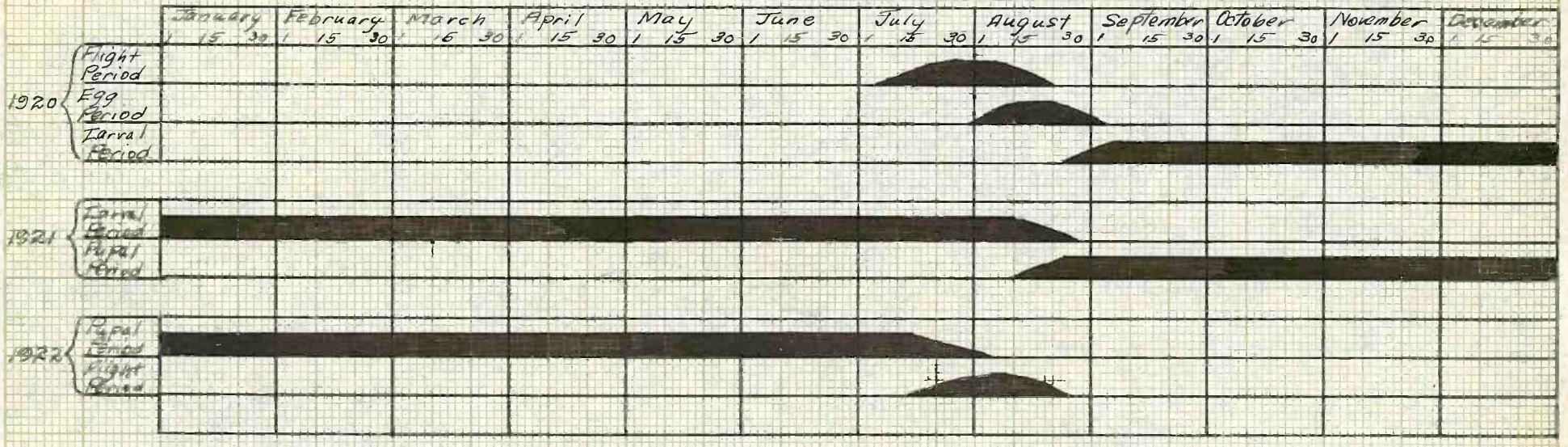
Respectfully submitted,

J. E. Patterson,
Entomological Ranger.

Ashland, Oregon.
November 15, 1922.

Fig. 1 – Chart showing Life History of Coloradia pandora, Blake, on the Klamath Indian Reservation, Oregon



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Yellow pine trees near Riggs Springs which have been defoliated by C. pandora. Note that the large tree in the center has been severely defoliated. The amount of foliage it has lost is apparent when the tree is compared with the white fir at the extreme left of the picture. It will also be noted that the young needles and the buds at the extremity of the branchlets have not been eaten by the caterpillars. August 24, 1922. -Photo by J.E.Patterson.

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A group of defoliated yellow pine trees in a medium aged stand near Calimus Butte, These trees have all been severely defoliated. August 24, 1921. -Photo by J.E.Patterson.

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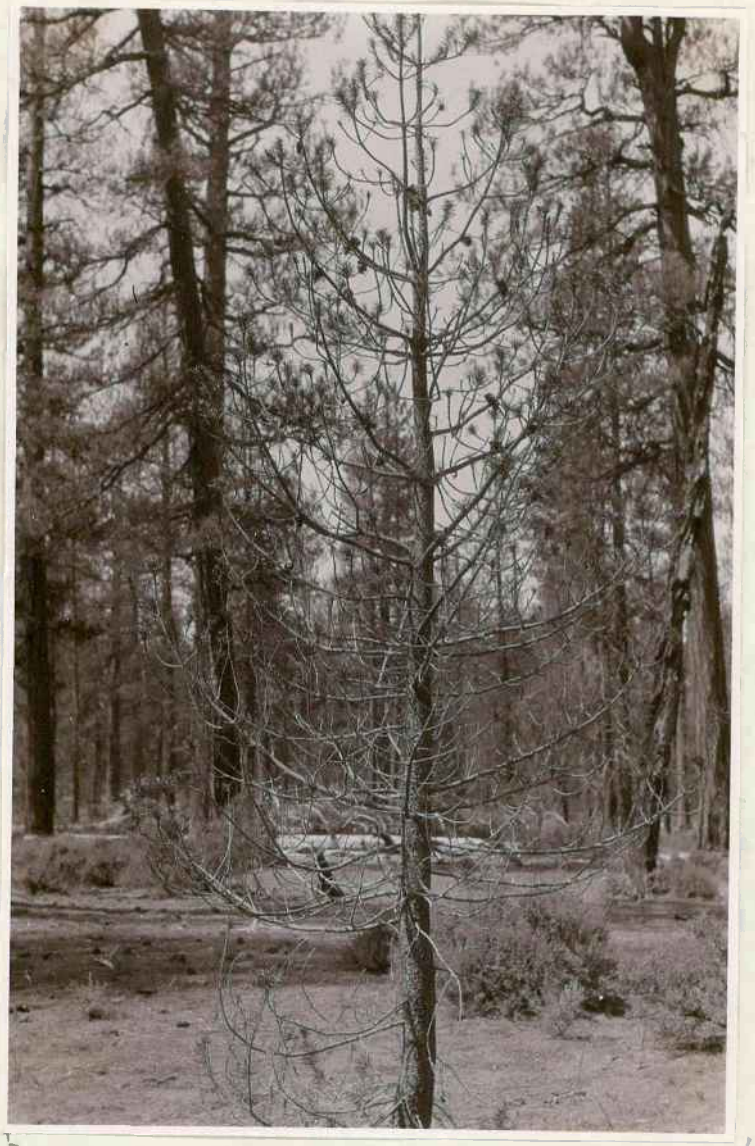

A small lodgepole pine tree that has been almost entirely denuded of foliage by the caterpillars. This tree was in one of the heavily infested areas near the upper Williamson River. August 24, 1921. -Photo by J.E.Patterson.

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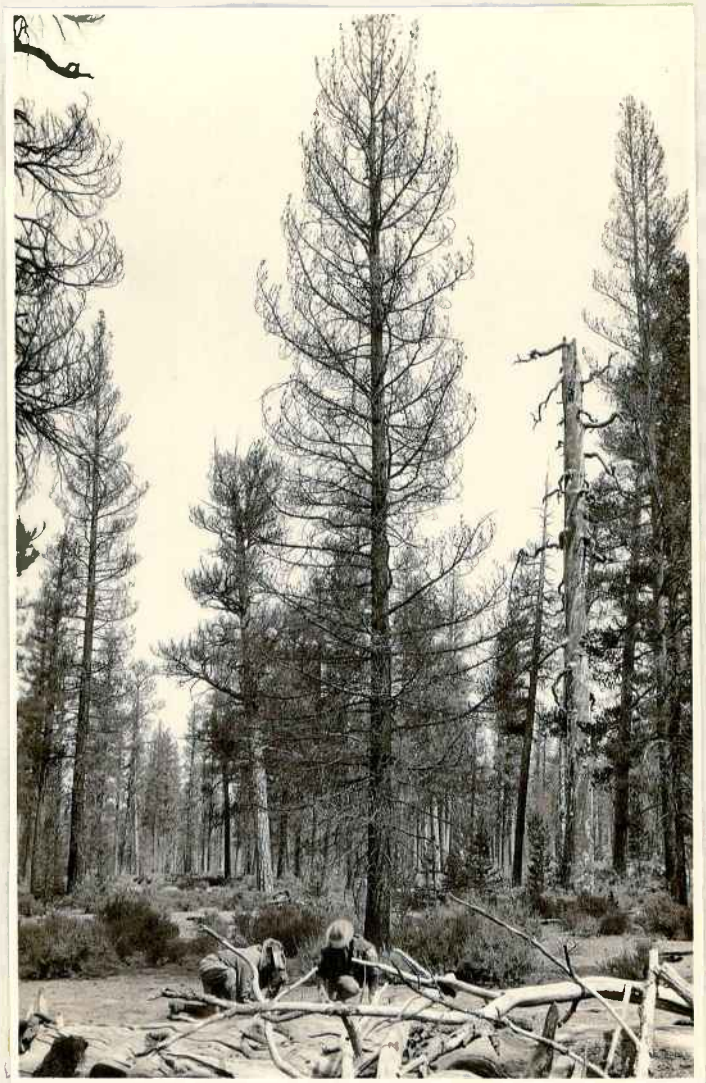

Collecting pupae of Coloradia pandora from the pumice soil in an infested area near the upper Williamson River. Note the defoliated trees in the background. The lodgepole pine in the center has been almost completely stripped of foliage.
August 24, 1921. -Photo by J.E.Patterson.

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A virgin stand of yellow pine timber near Wocus Bay, Upper Klamath Marsh, which has been severely defoliated. The severity of the damage was greater here than on any other area examined. 84 pupae of Coloradia pandora were found in an area 10 feet square under the trees in the foreground.
August 25, 1921. -Photo by J.E.Patterson.

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Showing pupae of Coloradia pandora in loose pumice soil which have been exposed by removing the ground cover and surface soil. The pupae are dark brown in clor and are 25mm. long and 12mm. wide. They regularly occur from 1 to 3 inches beneath the ground surface. Their position is slightly inclined from the vertical with the head up as shown by the specimen at the pencil point. The large number of pupae found was indicative of the great numbers of individuals in this generation of 1920. The picture was made near the upper Williamson River. August 25, 1921. -Photo by J.E.Patterson.

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R. 7½ E. R. 7 E. R. 8 E. R. 9 E. R. 10 E. R. 11 E. R. 12 E. R. 13 E.

MAP OF
KLAMATH INDIAN RESERVATION
OREGON
1911

DEPARTMENT OF THE INTERIOR
OFFICE OF INDIAN AFFAIRS
Hon. R. G. Valentine, Commissioner.

Scale of Miles

Distribution of Coloradia pandora

Distribution of Caterpillars in 1919

Distribution of Caterpillars in 1920

Infested Area Reported South the Sprague River in 1921 + 1922

T. 29 S.
T. 30 S.
T. 31 S.
T. 32 S.
T. 33 S.
T. 34 S.
T. 35 S.
T. 36 S.
T. 37 S.

LEGEND
- Agency Reserves
- School
- Church
- Cemetry
- Roads and trails
- Railroads (being constructed)

TYPICAL TOWNSHIP.
(½ Scale of Map.)

Sinks
Round Bu.
Little Yamsay Mt.
Williamson River
Big Spring
Yamsay Mt.
6th Standard Parallel S.
Sapee Cr.
Said Cr.
Aspen Cr.
Spring
Long Cr.
Coyote Cr.
Unsurveyed
Sycan River
Fuego Mt. 7020
Wood River
Klamath Agency and School
Chiloquin Cemetry
Klamath Lake
Upper Klamath Lake
Williamson River
Lay Lakes
David Hill Cemetery
Modoc Pt. Day School
Modoc Pt.
LOWER KLAMATH LAKE
Saddle Mt. 6976
Swan Lake Pt. 7000
Trout Cr.
Sprague River Bridge
7th Standard Parallel S.
Yainax Agency
Jackson's Cemetry
Day School
Whiskey Cr.
Meth. Episcopal Ch.
Mo-ghen Kast-it Cemetry
5 Mile Cr.
R. 10 E.
R. 11½ E.

Compiled and drawn by Albert Henderson.

Defoliation Distribution